

CHAPTER 3

GENERAL OPERATIONS AND PROCEDURES

3.1 General. An agency response to an event deemed to be under this plan shall be at the discretion and within the mission authority and resources of that agency. The OFCM serves as the WG/NDR/PSDA's executive agent to coordinate agency responses. The agencies participating in this effort typically have overlapping requirements for the event responses and data types. Agencies often acquire the same data type following an event but may use the data for substantially different purposes. For example, inundation data following a coastal storm may be used by one agency for flood hazard risk assessment purposes while another agency may use the same data for structural performance evaluation purposes. There are other events where one or two agencies may have little or no interest and no mission authority. An example would be a severe tornado outbreak. Unless the event directly affected a DOD installation, the DOD probably would have no justification for a response within the scope of this plan.

3.2 Concept of Operations. The plan of operations described herein is formulated to insure that agency responses to mutually examined events are adequate, while minimizing the expenditure of resources on events of interest to a single agency, or events of no common interest. Moreover, the plan has been organized to allow for changes in the scope of responses to particular types of events, and adoption or implementation of emerging technology, without requiring a revision of the entire plan.

3.2.1 Agency Structures. Agency coordination responsibility for a storm response does not necessarily reside within analogous elements of the agencies. Consequently, identification of the responsible agency element is not feasible by use of a generic organization chart. Moreover, in the present climate of active agency restructuring, such a chart could quickly become obsolete. Home pages of many federal agencies, which include links to current organization information, are posted on the World Wide Web. Appendix C contains Uniform Resource Locator (URL) information for the home page addresses of the participating federal agencies. Contact information for agency representation on the WG/NDR/PSDA are provided in Appendix D.

3.3 Initiation Criteria and Mechanisms. Initiation criteria for coordinating agency responses to a particular event depend upon the event. Events for which there is typically adequate warning, such as landfalling storms and inland floods, permit evaluation of the situation as it develops, and criteria are formulated accordingly. For other events, such as tsunamis and tornadoes, there may be little or no warning and little time to assess the initial effects of the event, if indeed an event occurs. A timely response therefore requires that initiation criteria be based upon the presumption of occurrence of a significant event. For reference purposes, the Saffir-Simpson Hurricane Scale and the Fujita Tornado Intensity Scale are provided in Appendices E and F, respectively.

3.3.1 Tropical Storms and Hurricanes/Typhoons. The response to a landfalling tropical storm or hurricane/typhoon shall be considered at least 48 hours prior to expected landfall if adequate forecast information is available. Otherwise, a response shall be considered as soon as

forecast information indicates the presence of a potential landfall situation. WG/NDR/PSDA members shall monitor storm development during the official hurricane season and contact the chairperson of the working group or, if unavailable, the Federal Coordinator designee when a landfalling storm or hurricane situation develops. The preferred manner of coordination among members of the working group is via telephone conference call. If impractical or unavailable, individual phone communication or electronic mail should be used.

The NWS may deploy a special QRT and/or Service Assessment Team following significant tropical storms and hurricanes/typhoons. OFCM will be notified by NWS Headquarters, OCWWS, if a team(s) is being deployed. OFCM shall notify via phone, the appropriate members of the WG/NDR/PSDA that a NWS QRT and/or Service Assessment Team has been deployed. Subsequently, if other members of the WG/NDR/PSDA deploy a field survey team, they will notify OFCM via phone. OFCM will then notify via phone NWS Headquarters about the deployment.

3.3.2 Extratropical Storms. Responses to extratropical storms shall be considered on an individual basis. Most extratropical storms which affect the U.S. coastline occur between October and April. A typical season will produce three or four events along the northeast coast which warrant response consideration, with typically fewer events along the Gulf of Mexico and Pacific coastlines. Characteristics of extratropical events to be considered in initiating a response are:

- a. an unusually high surge (in an historical context) at a particular coastal location;
- b. an unusually prolonged period (e.g., several days) of elevated coastal water levels;
- c. an extended reach (hundreds of miles) of affected coastline;
- d. prolonged and/or unusually high surface wind speeds;
- e. unusually long (> 16s) wind-generated wave periods along the Atlantic and Gulf of Mexico coasts; and/or
- f. precipitation rates resulting in total rainfall that could cause potential flooding or flash-flooding; freezing and/or precipitation to the extent that accumulation of snow/ice on roadways/railways/airports/walkways is expected to cause such modes of transportation to become inoperative, or when the precipitation rate reduces visibility such that transportation is excessively hazardous, or when the accumulation of snow/ice on the built environment is expected to become a hazard due to structural failure.

Consideration of responses to extratropical events shall be coordinated among members of the working group in the same manner as for tropical storms and hurricanes.

3.3.3 Severe Convective Outbreaks. While conditions favorable for large-scale tornadic and other severe convective storms may be identified in advance, present forecast skill does not allow for definitive 12-h or longer forecasts of the number, specific location, and intensity of

individual tornadoes. The SPC should notify the working group when a major tornado outbreak is forecast, but frequently significant individual storms will occur without this prior notification. The NWS will conduct a PSDA survey following all severe convective storms in which wind damage occurs. The WCM at each of the 122 weather forecast offices are the initial respondents to major weather events, documenting apparent damage and causal effects, as well as commentary from witnesses.

The NWS will deploy a QRT for all tornadoes that are suspected of producing greater than F3 damage. An NWS Service Assessment Team may also be assembled for these events. In addition, the NWS may dispatch a QRT and/or Service Assessment Team for other significant severe convective wind events. The decision to deploy these teams will be made on a case-by-case basis.

OFCM will be notified of a NWS QRT and/or Service Assessment Team deployment by the NWS Headquarters, OCWWS. OFCM will notify via phone, all appropriate agencies of the WG/NDR/PSDA that a NWS team has been deployed. Subsequently, if other agencies of the WG/NDR/PSDA deploy field survey teams, they will notify OFCM via phone. OFCM will then notify NWS Headquarters about the deployment.

3.3.4 Tsunamis. Tsunami warnings are issued based upon seismic data indicating the occurrence of a sub-sea earthquake. The seismic data do not indicate the presence of a tsunami, only the possibility of one. Some oceanic regions where tsunamis are likely to be generated, such as the Aleutian Trench, are monitored for the passage of deep-ocean tsunamis. However, such monitoring networks are limited to a few regions worldwide. Because tsunamis travel very fast in the deep ocean with phase speeds of hundreds of kilometers per hour, there is typically only a few hours between the detection of a sub-sea earthquake and the tsunami's arrival. If the quake occurs near a coastline, the tsunami can arrive in a matter of minutes. Major tsunamis are principally generated by sub-sea earthquakes of magnitude greater than 6.5 (Richter scale) with focal depths less than 50 km.

Given the likely scenario that any generated tsunami already will have arrived by the time the WG/NDR/PSDA can be notified, the decision to be made will be the level of response. Those members of the working group participating in a response shall coordinate the response based upon reports assessing the damage in the affected area. The Federal Coordinator shall be informed of developments and apprised of the planned response.

3.3.5 Riverine Flooding. Responses to major riverine flood events shall be considered on an individual basis. Forecasts allow several days to weeks lead time to prepare for major flooding and to make decisions/preparations for post-storm data acquisition. Major floods can occur at any time of the year, although some areas of the country are at elevated risk for flooding during certain parts of year (e.g., West Coast, November - March; western mountains, March - June; Midwest, late winter - early spring; Southeast, late summer - early fall). Annual flood damages average near \$3 billion, and many years experience several major floods.

Floods that are included in Presidentially declared disasters will be obvious candidates for flood documentation studies as well as floods of great magnitude or rarity. A flood rarer than that expected once every 200 years probably should be investigated. An estimate of flood magnitude and frequency can be formed based on available records of streamflow or FEMA FIRM maps.

Documentation of floods that provide information useful for making significant improvements in river forecast models should receive priority consideration. Unusual conditions include flash floods, dam failures, ice jams, floods of tributaries that were caused by backwater from a large stream, and floods that significantly exceed the maximum discharge covered by the stage-discharge relation at NWS forecast or model control points. Local NWS and USGS offices can verify that a flood exceeded the documented stage-discharge rating.

The NWS's Hydrologic Information Center and the USGS's WRD monitor flood conditions throughout the year, and each can notify the OFCM of potential major flood situations and will provide information during the flooding event.

3.4 Response Procedures. Coordination of agency responses to an event are desired where there are common activities in a common geographic area and common or overlapping data requirements. The specific agency responses following an event will depend to some extent on the nature and characteristics of the event.

3.4.1 Tropical Storms and Cyclones. NOAA/NWS shall have primary responsibility for providing forecast, warning, and near-real-time track and intensity data to the other agencies. The USACE and USGS shall have primary responsibility for providing resources for assessment of coastal and/or inland flooding and damages. NIST shall have primary responsibility for providing resources for assessment of structural damage. For declared disaster events, FEMA shall mission assign agencies to acquire data to satisfy FEMA mission requirements. USDA shall have primary responsibility for providing data (where available) on precipitation effects.

Upon the WG/NDR/PSDA's recommendation, the following activities will be initiated after landfall of a tropical storm or hurricane.

- USGS and USACE shall coordinate the deployment of field teams for the identification and recovery of high-water mark data. The teams shall be deployed in the affected area within 72 hours of landfall if possible. Leaders of field teams should secure lodging for themselves and team members prior to landfall. The lodging should be located close enough to the expected point of landfall to permit rapid deployment but distant enough to be substantially unaffected by the storm.
- NOAA shall coordinate the acquisition of satellite imagery and post-event aerial photography. Oblique hand-held video or aerial photography is useful for preliminary damage assessment, but controlled photography is required for quantitative determination of changes in shoreline morphology, assessment of other coastal processes, and identification of tornado tracks. Coordination of acquisition of controlled

photography shall include identification and securing of suitable aircraft platforms, selection of scale of aerial photography, specification track lines to be flown, and percentage of image overlap.

- NOAA/NWS will deploy field teams to assess the damage and performance of structures in the affected area. NIST may also deploy a team if the damage is sufficient enough to warrant this action. Team leaders should follow the same guidance for securing lodging as the high-water mark field teams.
- The NWS may deploy a QRT and/or Service Assessment Team following significant tropical storms and cyclones. OFCM will be notified of these deployments by the NWS Headquarters, OCWWS. OFCM will then notify via phone, all appropriate agencies of the WG/NDR/PSDA that a NWS team has been deployed. Subsequently, if other agencies of the WG/NDR/PSDA deploy a field survey team, they will notify OFCM via phone. OFCM will then notify NWS Headquarters about the deployment.

3.4.2 Extratropical Storms. The procedure for extratropical storms is essentially the same as for tropical storms and hurricanes. NOAA/NWS shall have primary responsibility for providing forecast, warning, and near-real-time track and intensity data to the other agencies. USACE and USGS shall have primary responsibility for providing resources for assessment of coastal and/or inland flooding and damages. NIST shall have primary responsibility for providing resources for assessment of structural damage. FEMA shall have primary responsibility for providing funds for reimbursement of tasks performed by other agencies which address FEMA mission requirements. For cases not addressed by FEMA mission requirements, the remaining agencies shall support acquisition of post-storm data at a level consistent with the resources available. USDA shall have primary responsibility for providing data (where available) on precipitation effects.

Upon the WG/NDR/PSDA's recommendation, the following activities will be initiated during or following an extratropical event which significantly impacts a coastal area:

- USGS and USACE shall coordinate the deployment of field teams for the identification and recovery of high-water mark data. If possible, the teams shall be deployed in the affected area within 72 hours of the occurrence of significant coastal flooding, erosion, or damage to coastal structures. Leaders of field teams should secure lodging for themselves and team members at locations substantially unaffected by the storm.
- NOAA shall coordinate the acquisition of satellite imagery and post-event aerial photography. Oblique hand-held video or aerial photography is useful for preliminary damage assessment, but controlled photography is required for quantitative determination of changes in shoreline morphology, and assessment of other coastal processes. Coordination of acquisition of controlled photography shall include identification and securing of suitable aircraft platforms, selection of scale of aerial photography, specification track lines to be flown, and percentage of image overlap.

- NOAA/NWS will deploy field teams to assess the damage and performance of structures in the affected area. NIST may also deploy a team if damage is sufficient enough to warrant this action. Team leaders should follow the same guidance for securing lodging as the high-water mark field teams.

3.4.3 Tornadoes and Other Severe Convective Storms. Upon the working group's recommendation, the following shall be initiated following a significant event:

- For all tornadoes producing potentially greater than F3 damage, the NWS will activate a QRT to photographically document storm damage intensity distribution by both aerial and ground surveys. Such a survey must be made within 24 hours of an event, so that salvage and clean-up efforts do not obscure the storm's true effects.
- NOAA/NWS shall coordinate the acquisition of satellite imagery and post-event aerial photography. Oblique hand-held video or aerial photography is useful for preliminary damage assessment. Coordinating acquisition of controlled photography shall include identifying and securing suitable aircraft platforms, selecting scale of aerial photography, specifying track lines to be flown, and percentage of image overlap. In addition, the local field WCM will ask the public to provide videotapes and other photographs of the storm.

3.4.4 Tsunamis. Tsunamis may result from near- or far-field seismic events. The effects resulting from a near-field seismic event likely will be catastrophic. Such an event will undoubtedly have national attention focused upon it, and the WG/NDR/PSDA resources available to respond to inquiries and requests certainly will be strained. However, while the damage from a near-field tsunami likely will be severe, the affected area (or coastal reach) will be more confined than that resulting from a significant far-field tsunami. Obviously, there will be no advance warning in the case of a near-field tsunami event. The most efficient response will involve an aerial reconnaissance to delimit the affected area, perform a preliminary assessment of the damage extent, and aid in directing ground crews into the area via the most efficient routes. Aircraft to perform this function would be obtained by the same means as for post-tornado assessment.

A far-field tsunamigenic event may present some advance warning, perhaps as much as a half day for some locations. Also, tsunamis transiting some Pacific Ocean areas may be detected and confirmed while still at sea. Such detection and confirmation will provide an estimate of the likely impact area and severity upon which to gauge an appropriate response level. Upon arrival, a far-field tsunami event would be preliminarily assessed similar to a near-field event.

Presumably there will be little or no meteorological effects involved in tsunami events; therefore, NOAA resources that might otherwise be directed toward wind-field studies could be used to supplement other agency efforts in the determination of hydrodynamic effects.

3.4.5 Riverine Flooding. The procedure for riverine flooding is essentially the same as for tropical storms and hurricanes. NWS shall have primary responsibility for providing forecast,

warning, and near-real-time track and intensity data to other agencies. The USACE and the USGS shall have primary responsibility for providing resources for assessment of coastal and/or inland flooding and damages, and for documenting stream stages and discharges. NIST shall have primary responsibility for providing resources for assessment of structural damage. FEMA shall have primary responsibility for providing funds for reimbursement of tasks performed by other agencies which address FEMA mission requirements. For cases not addressed by FEMA mission requirements, the remaining agencies shall support acquisition of post-storm data at a level consistent with the resources available. USDA shall have primary responsibility for providing data (where available) on precipitation effects.

Upon the WG/NDR/PSDA's recommendation, the following activities will be initiated during or following extensive riverine flooding:

- USGS and USACE shall coordinate the deployment of hydrologic-data field teams for the identification and recovery of high-water mark data and for the determination of discharge measurements. To the extent practical, high priority sites will be identified in advance of the event by USGS in consultation with USACE and NWS. When possible, the teams shall be deployed in the affected areas within 72 hours of the occurrence of significant flooding, erosion, or damage to structures. Leaders of field teams should secure lodging for themselves and team members at locations substantially unaffected by storm damage.
- NOAA shall coordinate the acquisition of satellite imagery and post-event photography. Oblique hand-held video or aerial photography is useful for preliminary damage assessment, but controlled photography is required for quantitative determination of changes in river morphology, extent of inundation and assessment of other erosion processes, including levee breaks and damage to other control structures. Coordination of acquisition of controlled photography shall include identification of and securing of suitable aircraft platforms, selection of scale of aerial photography, specification of track lines to be flown, and percentage of image overlap.
- NOAA/NWS will deploy field teams to assess the damage and performance of structures in the affected area. NIST may also deploy a team if damage is sufficient enough to warrant this action. Team leaders should follow the same guidance for securing lodging as the high-water mark field teams.

3.5 Data Acquisition Procedures. Because all events specified in the WG/NDR/PSDA Terms of Reference share some common characteristics, the data acquisition procedures share some similarities. Sections 3.5.1 through 3.5.4 provide general guidance on procedures, type, and quantity of data. Appendix G contains an example of detailed procedures to be used for high-water mark identification and recovery used by USGS.

3.5.1 Tropical Cyclones.

- NOAA shall assemble and analyze available wind data, and provide anemometer records and synoptic depictions of near-surface wind fields. Available barographs shall be assembled; satellite and radar imagery data and other information which might aid to determine the point of landfall shall be assembled. Synoptic depictions of near-surface wind fields shall be prepared at 6-h intervals for the 48-h period prior to landfall and, if feasible, at 3-h intervals for the 12-h period prior to landfall. Time-dependent central pressure and maximum-wind radii data shall be assembled, tabulated, and plotted.
- The appropriate USACE District office shall be contacted as to the availability of field teams to identify, preserve, and level high-water marks in the affected area. The teams will coordinate their activities through the Federal Coordinator and field directors of USGS, FEMA, NIST, and NOAA/NWS, but shall remain under the control of the USACE. In the event NOAA-provided controlled aerial photography is unavailable or beyond the resources of the participating agencies, USACE shall explore use of a commercial service through existing USACE contracts. Where substantial or significant coastal morphological changes or damage to navigation structures have occurred, USACE may perform assessments.
- The appropriate USGS district office shall be contacted as to availability of field teams to identify, preserve, and level high-water marks in the affected area. The teams will coordinate their activities through the Federal Coordinator and field directors of USACE, FEMA, NIST, and NOAA, but shall remain under the control of USGS. Where available, USGS shall provide data, imagery, or information on pre-existing conditions of the affected area.
- FEMA shall provide resources as available to the other participating agencies along with guidance on FEMA's specific data requirements for the particular event.
- USDA shall provide available precipitation, soil erosion, and agricultural damage data.
- NIST and NOAA shall provide field teams to assess the storm-induced structural damage. Where possible, charts depicting estimates of the surface wind speeds inferred from structural effects shall be prepared.
- The NWS may deploy a QRT and/or Service Assessment Team following significant tropical cyclones. OFCM will be notified of these deployments by the NWS Headquarters, OCWWS. OFCM will then notify via phone, all appropriate agencies of the WG/NDR/PSDA that a NWS team is being deployed. Subsequently, if other agencies of the WG/NDR/PSDA deploy a field survey team, they will notify OFCM via phone. OFCM will then notify NWS Headquarters about the deployment.

3.5.2 Extratropical Storms.

- NOAA shall assemble and analyze available wind data, and provide anemometer records and synoptic depictions of near-surface wind fields. Available barographs shall be assembled; satellite and radar imagery data and other information which might aid to determine the extent and evolution of the system shall be assembled. Synoptic depictions of near-surface wind fields at six-hour intervals shall be prepared. Available buoy and Coastal-Marine Automated Network station wave, wind, and pressure data shall be assembled.
- USACE responsibilities shall be the same as for tropical storms and hurricanes.
- USGS responsibilities shall be the same as for tropical storms and hurricanes.
- FEMA responsibilities shall be the same as for tropical storms and hurricanes.
- USDA responsibilities shall be the same as for tropical storms and hurricanes.
- NIST responsibilities shall be the same as for tropical storms and hurricanes.

3.5.3 Tornadoes and Other Severe Convective Storms. NOAA/NWS shall assemble and analyze damage survey findings, satellite and radar imagery, videotapes, and other information while determining the structure and organization of the tornadic storm(s). These data will become part of a national database to be used in evaluating the geographic distribution of tornado risk.

3.5.4 Tsunamis. The data-acquisition procedures for tsunamis shall parallel the procedures for acquisition of hydrodynamic and structural effects data following a tropical storm or hurricane. In addition, available hydrographs acquired at open ocean and affected coastal locations shall be assembled. Estimates of the net sub-sea bottom displacement are desirable, and if not otherwise available, consideration should be given to using WG/NDR/PSDA resources to develop such estimates.

3.5.5 Riverine Flooding. The NOAA shall assemble and analyze satellite and radar imagery data and other information which might aid in determining areas of greatest precipitation. When possible, post-storm surveys documenting extreme conditions (precipitation and streamflow) will be conducted by the most efficient means possible. The NWS will provide forecasts of impending precipitation along with issuing flood watches and warnings. If possible, local NOAA offices will discuss impending flooding with local USACE and USGS offices to aid in targeting the field deployment of personnel from these agencies. Similar coordination will occur at the national headquarters level between the NWS, FEMA, USACE, and USGS.

The USACE and USGS responsibilities shall be the same as for tropical storms and hurricanes with the addition of providing field teams and equipment to make discharge and current velocity measurements where such teams are available.

The FEMA, USDA, and NIST responsibilities shall be the same as for tropical storms and hurricanes.